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GB A 2066792 GB 1408797 US 4371088  
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## (54) Tamper evident closures

(57) A tamper evident child resistant closure comprises an inner cap (3) surrounded by an outer cap (2). The caps are biased into the illustrated position by leaf springs (8) integral with the inner cap, and in this position ratchet teeth on the inner cap skirt engage a saw-tooth profile track (12) on the outer cap (2) to permit tightening of but prevent removal of the closure. To remove the closure, the outer cap (2) is depressed to engage dogs on the outer cap in slots on the inner cap. On the first occasion that the outer cap is depressed a frangible disc (15) is broken away to provide tamper evidence.

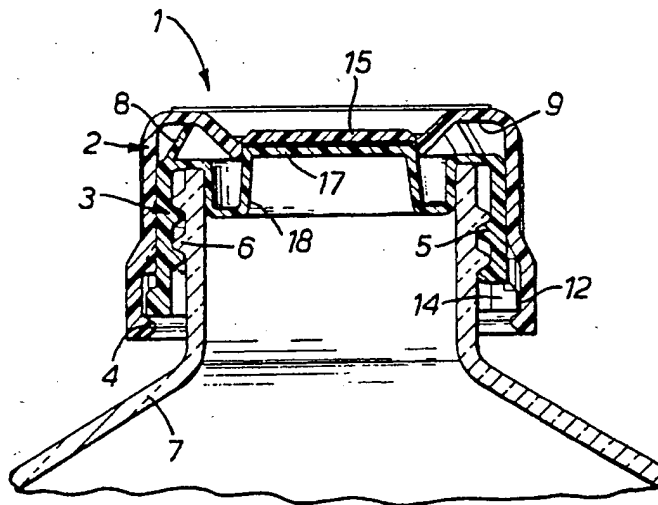


Fig.8.

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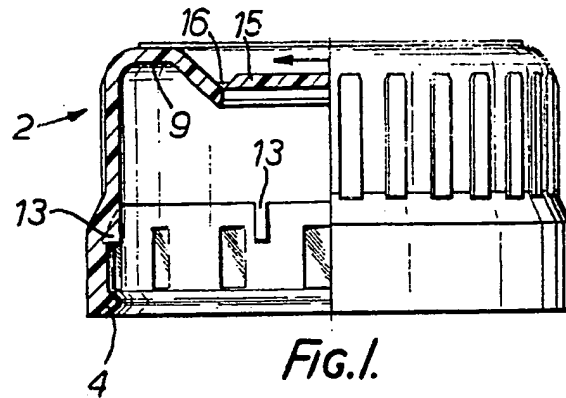


FIG. 1.

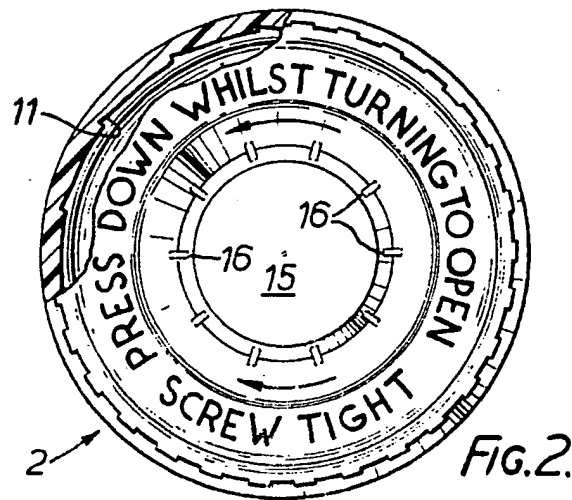


FIG. 2.

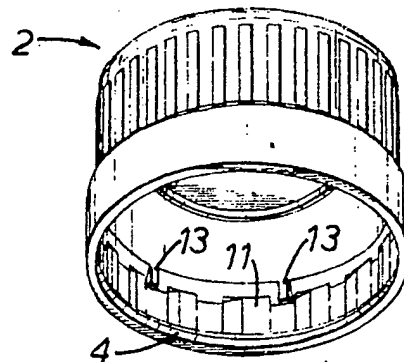
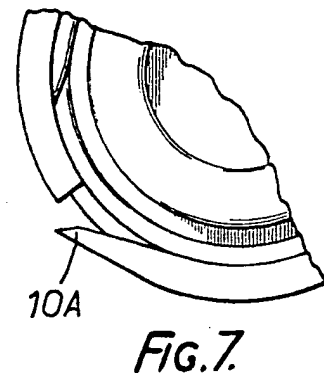
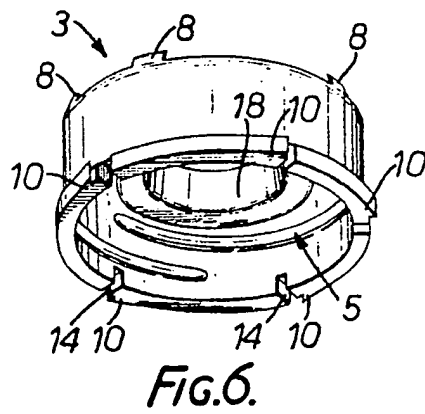
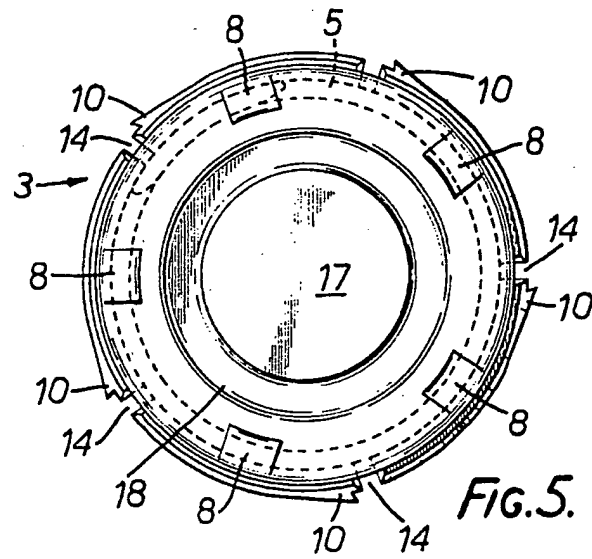
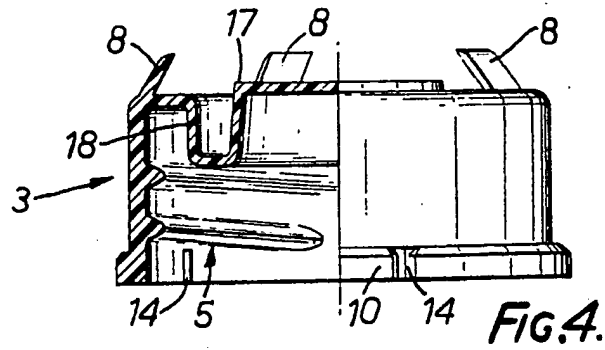


FIG. 3.

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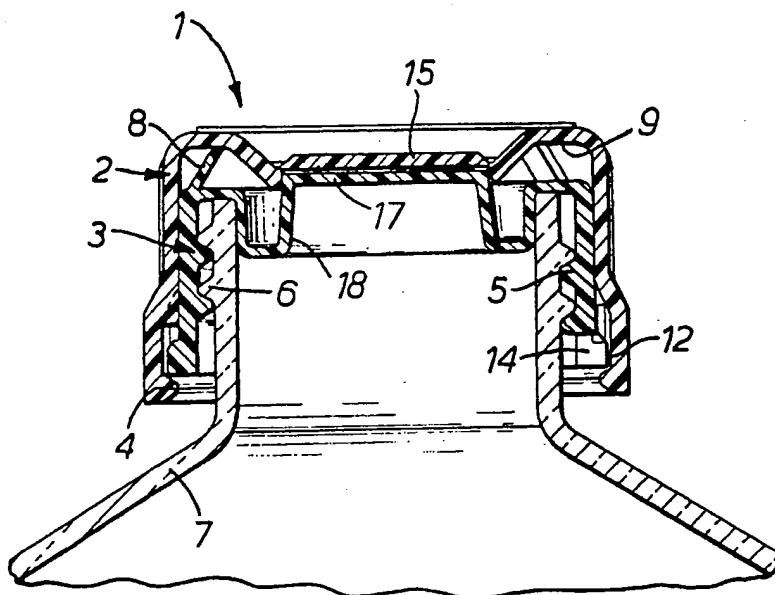


FIG. 8.

## SPECIFICATION

## Tamp r vid nt closures

5 This invention relates to a tamper evident closure, that is to say a closure which cannot be removed from its associated container and subsequently replaced without causing some permanent and readily apparent change to the closure.

10 Various tamper evident closures have been proposed for screw-topped containers. Such closures generally include a tear strip or band which must be removed to permit removal of the closure. Whilst such closures do offer the advantage of tamper evidence, they suffer from two disadvantages: firstly that they can only be installed by use of a relatively large and expensive machine, and secondly, after the tear strip has been removed, they do not offer any resistance to opening by children.

20 The need accordingly exists for a tamper evident closure which offers resistance to opening by children after the initial opening, and which preferably can be installed without special machinery. Such a closure would be particularly useful in the dispensing pharmaceutical trade where it would offer the opportunity for a pharmacist to place a dispensed prescription within a container, and then to install on that container a closure which would provide tamper evidence and child resistance.

25 According to one aspect of the present invention there is provided a tamper evident closure comprising: an inner internally threaded cap; an outer cap surrounding the inner cap; means biasing the inner and outer caps into a first relative axial position in which rotation of the outer cap in the sense to screw the inner cap onto a mating threaded member drives the inner cap and in which rotation of the outer cap in the opposite sense allows the outer cap to rotate relative to the inner cap, the caps being movable against the bias of the biasing means into a second relative axial position; connecting means operative when the caps are in the second relative axial position to drivingly interconnect the caps when the outer cap is rotated in said opposite sense; and a tamper indicating member which is connected to the remainder of the closure by frangible means which must be broken to permit the first movement of the caps into the second relative axial position.

35 Thus, the initial movement of the inner and outer caps into the configuration which permits unscrewing of the closure must be accomplished by breaking of the frangible means associated with the tamper indicating member. Thus, once screwed firmly onto the neck of a bottle the closure cannot be removed without leaving some indication of removal. After initial removal the closure functions as a child resistant closure.

40 In a preferred embodiment of the invention

the tamper indicating member is a disc which is moulded integrally with the outer cap, and is connected to the remainder of the outer cap by thin frangible webs. The disc overlies a projection on the inner cap so that, as pressure is applied to the outer cap in order to move the caps into the second relative axial position the projection automatically presses out the disc. The projection may include some word or symbol which is visible after removal of the disc in order to stress that the closure has been tampered with.

70 Preferably, the connecting means is separate from the biasing means and comprises a plurality of driving dogs on one of the caps which, when the caps are in the second relative axial position, engage slots in the other cap to provide a driving connection between the caps.

80 In the preferred embodiment of the invention the inner cap is formed integrally with a bung which extends into the mouth of the associated container to provide sealing of the mouth.

90 The above and further features and advantages of the invention will become clear from the following description of a preferred embodiment thereof, given by way of example only, reference being had to the accompanying drawings wherein:

95 Figure 1 is a side view, partly in section, of an outer cap;

Figure 2 is a plan view, partly in section, of the outer cap of figure 1;

100 Figure 3 is a perspective view of the outer cap of Figures 1 and 2;

Figures 4, 5 and 6 are views corresponding to Figures 1, 2 and 3 but showing an inner cap;

105 Figure 7 shows the modification of the inner cap of figures 4-6; and

Figure 8 is a cross-sectional view of a preferred embodiment of tamper evident closure located on a bottle neck.

110 The closure 1 illustrated in the drawings comprises an outer cap 2 (Figures 1-3) and an inner cap 3 (Figures 4-6). In the assembled closure (Figure 8) the outer cap surrounds the inner cap, and the inner cap is maintained within the outer cap by an inwardly directed bead 4 formed at the lower edge of the outer cap.

115 The inner cap 3 defines an internal screw thread 5 for mating with the threaded neck 6 of a container 7, e.g. a tablet bottle. The inner cap 3 is an integral plastics moulding and includes a plurality of upstanding leaf springs 8 which, in the assembled closure, engage a smooth annular surface 9 of the outer cap 2 in order to bias the inner and outer cap into a first relative position as illustrated in figure 8. In the first relative position of the inner and outer caps the lower edge of the inner cap engages the bead 4 of the outer cap.

130 The lower periphery of the inner cap is

formed with a plurality of ratchet teeth 10 which, when the caps are in the first relative axial position, cooperate with a saw-tooth profile 11 formed on the internal surface of the outer cap 2 to form a ratchet drive 12. The ratchet drive 12 operates such that rotation of the outer cap in the sense to screw the inner cap onto the threaded neck 6 provides a driving connection between the outer and inner caps, whereas rotation of the outer cap in the opposite sense (tending to unscrew the inner cap) causes the ratchet drive to slip. Thus, with the outer and inner caps in the first relative position the closure can be screwed onto the neck of the bottle, but cannot be removed.

In order to permit removal of the closure from a bottle a plurality of dogs 13 are formed on the internal surface of the outer cap 2 and a corresponding plurality of slots 14 are formed about the external periphery of the inner cap 3. In order to engage the dog 13 with the slots 14 the outer cap must be pressed downwardly as illustrated in figure 8 against the bias of the leaf springs 8 in order to bring the inner and outer caps into a second relative axial position. In this second relative axial position the dogs 13 are located within the slots 14 and the inner cap may be unscrewed. Upon release of downward pressure from the outer cap, the leaf springs 8 return the outer and inner cap to the first relative axial position.

The outer cap 2 is an integral plastics moulding and includes a central tamper indicating disc 15 which is connected to the remainder of the outer cap by frangible webs 16. The inner cap 3 includes a central projection 17 of substantially equal diameter to the disc 15. Thus, upon the first depression of the outer cap 2 in order to move the caps into the second relative axial position the projection 17 will break the webs 16 and the disc will fall away. The breaking of the webs 16 is thus indicative that the closure has been tampered with. Preferably, the upper surface of the projection 17 includes wording or other indicia drawing attention to the fact that if the disc 15 is not present, the closure has been tampered with.

After the disc 15 has been removed upon first opening of the container 7, the closure acts as a child resistant closure, in that once it has been firmly screwed on to the container neck it cannot be removed without depressing the outer cap 2 to engage the dogs 13 with the slots 14.

The inner cap 3 is formed with an integral bung portion 18 which, when the closure is in place on the container neck 6 forms a snug seal with the container neck.

It will be noted that the closure described above is completely self contained, and may be supplied loose to, for example, pharmacists who can use it to close newly dispensed

containers of, for example, tablets. The pharmacist need simply screw a closure tightly on to the neck of the container, no equipment of any sort being necessary to mount the closure. Once screwed firmly home the closure cannot be removed without breaking of the frangible webs 16.

Although the above described closure is particularly suitable for use in the retail pharmaceutical trade, it will be appreciated that it is more generally applicable and could, for example, be used by a manufacturer wishing to provide a combination of tamper evidence and child resistance to a particular container. Further, whilst in the preferred embodiment the tamper indicating member is in the form of a disc which is broken away from the outer cap as the outer and inner caps are moved to the second relative position, other arrangements are possible. For example, the tamper indicating member may be secured to the remainder of the closure in a manner which requires removal of the tamper evident member as a separate operation prior to moving the outer and inner cap into the second relative axial position.

In the modification shown in Figure 7 the ratchet teeth 10A are formed by finger-like projections formed integrally with the inner cap. Such projections will be more readily cammed inwardly during rotation of the outer cap in the sense tending to unscrew the inner cap than will the ratchet teeth 10 of Figures 4-6, and may be preferable in some circumstances.

## CLAIMS

1. A tamper evident closure comprising: an inner internally threaded cap; an outer cap surrounding the inner cap; means biasing the inner and outer caps into a first relative axial position in which rotation of the outer cap in the sense to screw the inner cap onto a mating threaded member drives the inner cap and in which rotation of the outer cap in the opposite sense allows the outer cap to rotate relative to the inner cap, the caps being movable against the bias of the biasing means into a second relative axial position; connecting means operative when the caps are in the second relative axial position to drivingly interconnect the caps when the outer cap is rotated in said opposite sense; and a tamper indicating member which is connected to the remainder of the closure by frangible means which must be broken to permit the first movement of the caps into the second relative axial position.

2. A tamper evident closure according to claim 1 wherein, when the inner and outer caps are in the first relative axial position, the outer cap is drivingly connected to the inner cap by a ratchet connection which permits the inner cap to be screwed onto a mating threaded member by rotation of the outer cap

in one sense but which slips upon rotation of the outer cap in the opposite sense.

3. A tamper evident closure according to claim 2 wherein the ratchet connection is  
5 separate from the biasing means.

4. A tamper evident closure according to claim 2 wherein the inner cap comprises an annular skirt and the ratchet connection comprises a plurality of ratchet teeth formed on  
10 the annular skirt for co-operation with an annular ratchet profile formed on the interior of the outer cap.

5. A tamper evident closure according to claim 4 wherein the ratchet profile is a saw-tooth profile.  
15

6. A tamper-evident closure according to claim 4 or claim 5 wherein the annular skirt comprises a plurality of segments arranged end to end around the free edge of the skirt,  
20 one end of each segment forming a ratchet tooth which is located radially outwardly of the adjacent segment end.

7. A tamper evident closure according to claim 6 wherein the portion of each segment  
25 which forms the ratchet tooth extends as a finger-like projection from the remainder of the inner cap.

8. A tamper evident closure according to claim 6 or claim 7 wherein there is a slot  
30 formed between the adjacent ends of each pair of segments, and wherein the outer cap is formed with dogs to engage in said slots when the caps are in the second relative axial position, said slots and said dogs forming said  
35 connecting means.

9. A tamper evident closure according to any preceding claim wherein the biasing means comprise leaf springs moulded integrally with the inner cap.

- 40 10. A tamper evident closure according to claim 9 wherein, in their relaxed state, the leaf springs extend from their fixed ends to their free ends obliquely towards the axis of rotation of the closure.

- 45 11. A tamper evident closure according to claim 10 wherein the free ends of the springs engage a smooth radial surface of the outer cap.

12. A tamper evident closure, substantially  
50 as hereinbefore described with reference to the accompanying drawings.